

AGENCY FOR INTERNATIONAL DEVELOPMENT  
 WASHINGTON, D. C. 20523  
**BIBLIOGRAPHIC INPUT SHEET**

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1. SUBJECT CLASSIFICATION	A. PRIMARY Agriculture
	B. SECONDARY Fisheries--Costa Rica

2. TITLE AND SUBTITLE  
 Artisanal fisheries in Costa Rica

3. AUTHOR(S)  
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4. DOCUMENT DATE 1974	5. NUMBER OF PAGES 8 p.	6. ARC NUMBER ARC
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7. REFERENCE ORGANIZATION NAME AND ADDRESS  
 University of Rhode Island, International Center for Marine Resources and Development, Kingston, Rhode Island 02881

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publisher, Availability)  
 (In Anthropology Working Paper No. 3)

9. ABSTRACT

A short, descriptive report covering the physical features of the Costa Rican coast; marine species utilized; the fishermen; production; artisanal fishing methods; fishing organizations and institutions; the marketing and distribution sector; plans, programs, and government involvement; and the potential for development. Artisanal fishermen produce a significant amount of fish classified as "white" fish, shark, lobster, mollusk, and turtle. The proposed FAO/BID project will facilitate the development of artisanal fisheries around the Gulf of Nicoya. Other cooperatives probably will enhance the development of artisanal fisheries in other sections of the Pacific Coast and satisfy the increased demand. An artisanal fishing cooperative with technical assistance and a minimum of processing and distribution equipment probably would help increase production of marine products on the Caribbean Coast where demand already exceeds supply. Further potential for development is seen in the area of mariculture, as indicated by experiments in mussel culture.

10. CONTROL NUMBER PN-AAC-269	11. PRICE OF DOCUMENT
12. DESCRIPTORS	13. PROJECT NUMBER
	14. CONTRACT NUMBER CSD-2455 211(d)
	15. TYPE OF DOCUMENT

CSO-2955 211(N)

PN-AAC-269

Anthropology Working Paper No. 3

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NOVEMBER 1974

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INTRODUCTION Costa Rica is the second smallest country in Central America with an area of approximately 51 thousand square kilometers and 1230 kilometers of coastline, 210 kilometers on the Atlantic and 1020 on the Pacific. The coastal plain is narrow on the Pacific and relatively wide on the Atlantic. Approximately 70 percent of the population of 1.8 million is concentrated in the central plateau where the capitol, San José (population 423,028 (1972)), is located. Puntarenas (population 32,891), the major population center on the Pacific coast and capitol of the Province of Puntarenas, is located 109 kilometers from San José. Traveling time from San José by electric train is three hours, by bus one and one-half hours, and by airplane fifteen minutes. The main port on the Atlantic coast, Limón (population 39,217), is located 165 kilometers from San José by train (6 hours travel time). A new all-weather road is being completed which will reduce this travel time by more than one-half. Flying time to Limón is 20 minutes.

PHYSICAL FEATURES OF THE COAST Costa Rica has 1230 kilometers of coastline with 210 kilometers on the Atlantic and 1020 on the Pacific (FAO 1974). The continental platform on the Pacific Coast can be divided into four well defined regions: 1) the platform of the Osa Peninsula; 2) the central platform; 3) the platform of the Nicoya Peninsula; and 4) the platform of the Gulf of Papagayo.<sup>1</sup>

The platform of the Osa Peninsula consists of approximately 470 square miles, 220 in Dulce Gulf and 250 along the coast. South of Punta Burica and along the south edge of the Osa Peninsula the bottom is sandy and with a predominance of rocks. The bottom becomes mostly mud at the western section of the peninsula and in Dulce Gulf. The bottom is rocky on either side of the entrance to the Gulf, with sand along the western edge.

The central platform is located between Punta Llorena and Cabo Blanco. It consists of approximately 2400 square miles and is divided into three principal zones. The platform of Quepos is located between Punta Llorena and Punta Judas and consists of approximately 1550 square miles of shelf area. Most of the bottom is composed of mud (1200 square miles) with very small rocky areas between Quepos and Punta Mala, around Cano Island, and at the border of the platform where both rocks and sand predominate. The bottom is also sandy and

<sup>1</sup>Data on the characteristics of the Pacific coast were abstracted from Vidal and Rosetti (1971).

rocky on the border of the Punta Judas zone. The Punta Judas zone is located between Punta Judas and Punta Herradura. The bottom of this zone is principally rock and sand and consists of an area of approximately 250 square miles. The Gulf of Nicoya consists of approximately 600 square miles with a floor of mud. Rocks are found in the southwest section along the coast.

The platform of the Nicoya Peninsula is located between Cabo Blanco and Cabo Velas and consists of approximately 530 square miles with a bottom of sand and rocks along the coast. At the edge of the platform the bottom is primarily mud.

The platform of the Gulf of Papagayo is located between Cabo Velas and 11 degrees north. This platform consists of an area of approximately 1000 square miles and has, for the most part, a mud bottom. A small area around Cabo Velas has a bottom of sand and rocks.

The area of the continental platform on the Caribbean is approximately 520 square miles and extremely narrow.<sup>2</sup> It extends to a maximum of 8 miles and a minimum of 2 miles with indentations of submarine canyons offshore of Matina River, northeast of Isla Uvita, and south of Punta Mona. A sand shelf bounded on its outside edge by a coralline ridge extends from Punta Mona to Punta Cahuita. This coralline ridge is at 15 fathoms east of Punta Mona. It descends to greater depths to the Northwest and then follows the 20-fathom isobath off Punta Cahuita. A mud-sand shelf extends from Punta Cahuita to Rio Colorado with its seaward extension reaching the 35-45 fathom depth. North of Isla Uvita the zone is bordered by three narrow coralline ridges. A wider ridge borders the mud-sand shelf south of Isla Uvita.

SPECIES UTILIZED Industrial fisheries account for most of the marine products produced in Costa Rica (Vidal *et al* 1971). They are specifically responsible for the tuna, thread herring and shrimp fisheries. Artisanal fishermen produce a significant amount of fish classified as "white" fish, shark, lobster, mollusk, and turtle.

The most important "white" fish are Croaker (Sciaenidae), Snapper (Lutjanidae), Mero (Serranidae), Snook (Centropomidae), Grunt (Comodasidae), and Flatfish (Gynoglossidae). Vidal, *et al* (1971) suggests that in terms of abundance, price, demand, and acceptance in national markets, the most important fish is the Croaker, followed by shark, then mero and snapper.

The most abundant shark species include Ephyrna zygaena, Carcharhinus leucas, and Prionace glauca (Vidal and Rosetti 1971:22).

<sup>2</sup>Data on the characteristics of the Atlantic Coast were abstracted from Yesaki and Giudicelli (1971).

Important lobster species are Panulirus gracilis and Evibacus princeps on the Pacific Coast and P. argus on the Atlantic. Principal mollusks on the Pacific are Anadara tuberculosa, A. multicostata, A. grandis, Donax sp., Protothaca sp., Mytella speciosa, M. guayanensis, M. falcata, Ostrea iridescens, O. columbiensis, Pinna rugosa, and Strombus gigas. No important mollusks are reported for the Atlantic Coast. The Sea Turtle (Chelonia mydas mydas) is the most important turtle and is captured along the Atlantic Coast (Vidal, et al 1971).

PERSONNEL The Pacific Coast produces 90 percent of the marine products for Costa Rica (Vidal, et al 1971). FAO (ND) reports coastal artisanal activity by about 400 small craft on the Pacific Coast (approximately 50 percent mechanized) producing about 500 tons of mixed "white" fish annually.

Most of the Pacific Coast artisanal fishermen are concentrated at the port of Puntarenas in the Gulf of Nicoya. A cooperative in the formative stage in Puntarenas had approximately 100 members and 36 motorized boats in mid 1974. It was reported that there were 250 artisanal fishermen outside the cooperative. Additionally, there is a small concentration of shark fishermen at Golfito in Golfo Dulce who operate about 40 boats (FAO, N.D.). Other small concentrations of artisanal fishermen can be found at numerous locations along the Pacific Coast.

The Atlantic Coast is far less productive than the Pacific. There are approximately 100 permanent and 90 part time artisanal fishermen concentrated around the Puerto Limon area (Ellis, et al 1971). Ellis, et al estimate that 100 boats are active during a good lobster season with a minimum of 20 operating year round.

PRODUCTION For the years 1967 to 1969 the average annual catch was 4.7 metric tons per kilometer of coastline, and the catch per square kilometer of shelf area was 440 kilograms (FAO 1974). The data for 1971 (FAO, N.D.) indicate that the catch had increased to 6.9 metric tons per kilometer of coastline. The mean estimated annual per capita consumption of fish for the period 1967 to 1969 was 3.42 kilograms, which was the highest in Central America (FAO 1974). In 1971 the per capita consumption of fish had increased to 4.7 kilograms (FAO, N.D.).

Vidal, et al (1974:83) present data indicating that the artisanal fisheries of Costa Rica provided only 33 percent of the "white" fish (pesce blanca o de consumo) during the years 1960 to 1970. The industrial fisheries produced the majority of "white" fish. The average production of "white" fish for the years 1968 to 1970 was 1490 metric tons on the Pacific coast and 12 metric tons on the Atlantic (Vidal, et al 1971).

With regard to shark, the average production from 1968 to 1970 on the Pacific Coast was 327.5 metric tons, and on the

Atlantic 42.1. During this same period the Pacific and Atlantic Coasts produced yearly averages of 5.5 and 65.9 metric tons of lobster respectively. It should be noted that the yearly catch of lobster on the Atlantic varied between 13.2 and 128.6 metric tons from 1968 to 1970. Variability in capture is clearly demonstrated in data from a longer time period. From 1957 to 1970 the Atlantic Coast produced an average of 125.6 metric tons of lobster per year with a range from 13.2 to 559.2 metric tons.

The Pacific Coast produced a yearly average of 20.9 metric tons of mollusks from 1968 to 1970 and the Atlantic produced a yearly average of 87.0 metric tons of turtle during this same period. The amount of turtle captured on the Atlantic Coast also manifests a great deal of yearly variation. From 1956 to 1970 the Atlantic Coast of Costa Rica produced a yearly average of 117.4 metric tons of turtle with a range of from 8.7 to 435.2 metric tons.<sup>2</sup>

FAO exploratory fishing operations in the Western Caribbean Sea during October 1969 report a virtual absence of Spiny Lobster (*P. argus*) off Costa Rica (Yesaki and Giudicelli 1971:93). The absence of lobster in an October test run is not altogether unexpected if one takes into consideration the variability of the reported catches and the fact that the season is restricted to December and January (Ellis, et al 1971) or from November to February, and variable (Windley 1968). With regard to shrimp, the FAO exploratory vessel reported moderate quantities of *Penaeus duorarum*, *P. schmitti*, and *Xiphopenaeus kroyeri* between 3 and 50 fathoms with concentrated effort in the 4 to 17 fathom range (Yesaki and Giudicelli 1971:96).

Findings relevant to the needs of artisanal fishermen were also reported by FAO research operations on the Pacific Coast of Costa Rica. The research vessels report very little lobster between September and November 1970. The largest amounts recorded per 50 traps per 12 hours were 2.4 lobster at Punta Guionos, 1.9 at Punta Uvita, 2.5 at Bahia Sierpe and Punta San Jose, and 5.1 in Bahia Pavon, Dulce Gulf (Vidal and Rosetti 1971). Respectable amounts of shark (more than 150 pounds, per 40 hooks, per 12 hours) were taken along the coast immediately north and south of Cabo Velas, and just off Punta Quinones, Punta Guapinol, and Punta Uvita (Vidal and Rosetti 1971). The highest catch rate obtained by trawling in Central America was made in the Gulf of Nicoya where 658.6 kilograms total catch per hour was recorded. The catch was dominated by grunts and croakers (FAO 1972:15). Both the Gulf of Nicoya and Dulce Gulf provided reasonable catches using hand and long lines and trolling. The FAO Terminal Report (1972:17) suggests that these sources of food fish be left to artisanal fishermen.

<sup>2</sup>The data for shark, lobster, mollusk, and turtle were abstracted from Vidal et al (1971).

ARTISANAL FISHING METHODS Data relating to artisanal fishing methods in Costa Rica is relatively scanty. Vidal et al (1971) report that shark are taken with handlines and gill nets on the Pacific Coast. In July 1974 artisanal fishermen on both coasts manifested a preference for using handlines to capture shark. "White" fish are captured with throw nets, gill nets, and handlines on both coasts (Vidal et al 1971). Boats used are usually 8 to 10 meters long with either inboard or outboard motors on the Pacific coast and 8 to 12 meters long, usually dugouts, with outboard motors on the Atlantic (Vidal et al 1971).

Artisanal fishermen obtain lobster by diving or with lobster traps on both coasts (Vidal et al 1971; Ellis et al 1971). Lobster nasas are also employed on the Pacific Coast (Vidal et al 1971). Mollusk are collected by hand except for squid which are captured in small gill nets.

Ellis et al (1971) report that turtle are captured on the Atlantic Coast with the use of either harpoons or large hand made mesh nets. When nets are used, a turtle shaped decoy carved from wood is placed at either side of the net to attract the turtle. In early July 1974, artisanal fishermen in Limon reported that they used only harpoon to capture turtle. It was reported that three men in an outboard motor powered dugout travelled approximately 30 miles to the hunting area and, with the use of harpoons, could capture as many as 8 or 9 turtle per day.

ORGANIZATIONS AND INSTITUTIONS IN THE FISHING SECTOR In mid 1974 a fishermen's cooperative was in the formative stage in Funtarenas with approximately 100 members and 36 motorized boats. The cooperative was located in a substantial building on the dock with cold storage tanks, electricity, and running water. Ice was obtained from an ice company with a 20 ton per day capacity located close to the cooperative building. An electric powered cold storage room for fish was being constructed in the cooperative building. At the same time it was reported that shark fishermen in Bolfito were organized into a cooperative, but at present no further information is available on this organization.

No cooperatives were in existence on the Atlantic Coast in mid 1974. Every fisherman interviewed expressed interest in forming a cooperative but suggested that the other fishermen would oppose such a plan.

No data is available concerning equipment ownership patterns on the Pacific Coast. In a survey of the Puerto Limon area conducted in 1967 Ellis et al (1971) report that among the permanent fishermen approximately 43 percent own their boats while 25 percent rent and 32 percent are salaried workers. Among the part time fishermen they report that approximately 32 percent own and 14 percent rent boats while 54 percent are salaried workers.

MARKETING AND DISTRIBUTION SECTOR In general the shore facilities for handling and distributing fish caught by artisanal fishermen are inadequate on both coasts of Costa Rica. The fish are landed at numerous beaches along the coast. Generally, fish are not iced while at sea and are beginning to deteriorate when they reach the beaches. In most cases fish are sold to middlemen who either sell them to fishmongers in town markets or simply hawk them along the streets. Fish are often transported without any cooling facilities, resulting in further deterioration. This method of distribution often leads to depressed prices on the part of the producer and inflated prices for the consumer who is sometimes faced with purchasing either semi-spoiled fish or none at all.

The artisanal fishing cooperative which was being formed in Puntarenas in mid 1974 provides a notable exception to this pattern. This cooperative has a substantial building, adequate cold storage tanks, and access to a good ice supply. In mid 1974 an electric powered cooling room was being constructed. It was reported that the cooperative has an agreement with the Consejo Nacional de Produccion (CNP) which buys fish at fixed prices and handles further distribution.

Spiny lobster caught by artisanal fishermen at Limon are sold directly to representatives of three different processing plants: Eugenio Carron e Hijos and Mariscos del Caribe in Limon and Alta Mar, S.A. in Puntarenas. Those processed in Puntarenas are shipped overland to the Pacific Coast. Windley (1968) reports that only about 2% of the lobster catch is consumed domestically. The processing plants in Limon also purchase turtle from the artisanal fishermen. In mid 1974 fishermen complained that with only two buyers there was a lack of competition resulting in price fixing. A representative of Mariscos del Caribe reported that after they take the approximately 50 pounds of calipee and choice turtle meat, the rest is distributed gratis to hospitals and local people who request it. Sometimes the fishermen sell turtle directly to fishmongers in the Limon central market where six stalls are set up to sell marine products. In mid 1974, fishmongers at the market complained that the demand for fish and turtle was much greater than the supply.

In sum, except for high priced export products like lobster and turtle calipee, the marketing and distribution networks are underdeveloped in Costa Rica. A notable exception to this generalization was found in the new cooperative in Puntarenas.

PLANS, PROGRAMS & GOVERNMENT INVOLVEMENT A proposed FAO/BID cooperative project should have considerable impact on the artisanal fishery on the Pacific Coast of Costa Rica (cf. FAO/BID 1972). This project is concerned with three important areas: (1) development of artisanal fisheries; (2) construction

of a fish terminal; and (3) development of the distribution and marketing network.

With respect to the artisanal fisheries the project proposes establishment of a fisherman's cooperative at Puntarenas with 47 thirty-one foot fibre glass, three ton capacity boats with 40 horse power motors and necessary auxillary equipment. Nets, lines and hooks will also be supplied. The fish terminal will serve to collect, process, and distribute the fish landed by independent artisanal fishermen, cooperative members, and industrial fleets. It is projected that the terminal will result in better prices for both consumer and producer. The terminal is supposed to have an annual capacity of 6000 tons by the third year of the project. Distribution will be augmented by establishment of improved distribution networks from the terminal. The processing performed at the terminal will also enhance distribution. In addition, a marine product promotion campaign will be conducted using the mass media.

POTENTIAL FOR DEVELOPMENT The proposed FAO/BID project (FAO/BID 1972) will facilitate development of artisanal fisheries around the Gulf of Nicoya. The project's marine product promotion campaign may stimulate demand to such an extent that it will exceed production. Cooperatives similar to that proposed at Puntarenas, but on a smaller scale, will probably enhance the development of artisanal fisheries at other sections of the Pacific Coast and satisfy the increased demand. An artisanal fishing cooperative with technical assistance and a minimum of processing and distribution equipment would probably help increase production of marine products on the Caribbean coast where demand already exceeds supply, especially since restrictions have been placed on turtle capture. The all-weather road to Limon, which should be completed soon, will open up new markets for Caribbean marine products, thus increasing the desirability of developing the proper exploitation of available resources.

Further potential for development is seen in the area of mariculture. The FAO Terminal Report (1972:21) indicates that experiments in mussel culture carried out in Costa Rica were quite successful, and a followup project of mussel culture on a commercial scale is planned for the Gulf of Nicoya. Additional research investigating the potential of numerous species could be carried out in salt and brackish waters along both coasts. Successful mariculture projects could lead to improved nutrition among local coastal populations either through direct consumption or by enhanced purchasing power after export to other regions.

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